

Hydrostatic Pump Repair

www.hydrostaticpumprepair.net

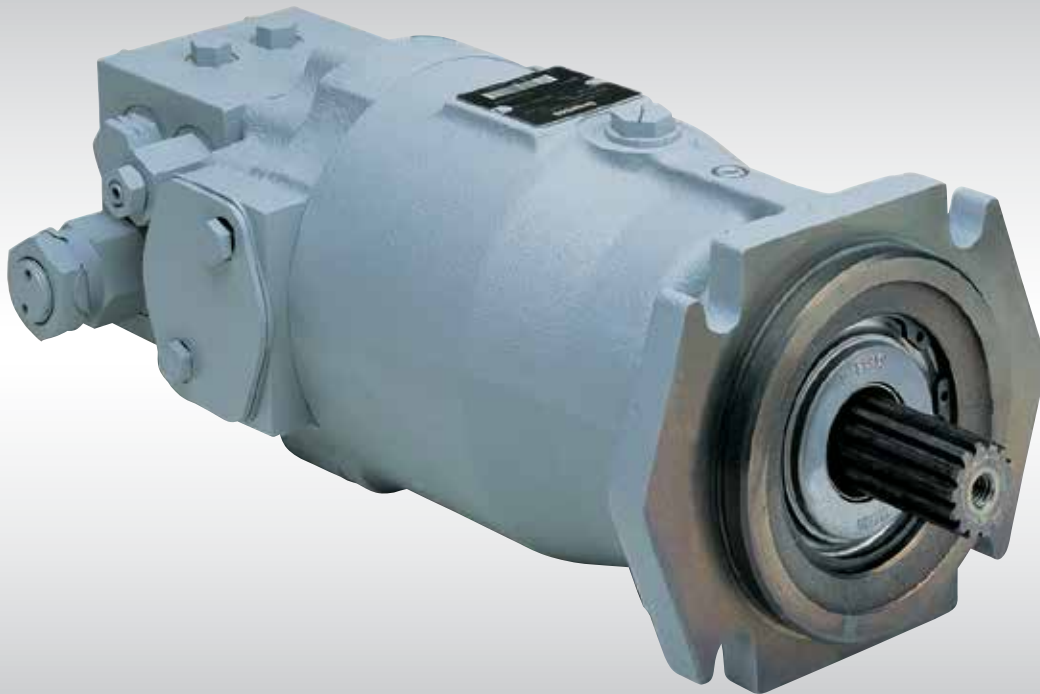
Phone: 800-361-0028

Email: sales@hydrostatic-transmission.com



Technical Information

Axial Piston Motors Series 20



General Information**Introduction**

Danfoss a world leader in hydraulic power systems has developed a family of axial piston motors.

Description

Danfoss axial pistons fixed displacement motors are of swash plate design with preset displacement suitable for hydrostatic transmissions with closed loop circuit.
The output speed is proportional to the motor's input flow.
The output torque is proportional to the differential pressure applied to the main pressure ports.
The direction of motor (output) shaft rotation depends on flow input to the main pressure ports.

Danfoss axial piston fixed displacement motors are well engineered and easy to handle.
The full-length shaft with a highly efficient tapered roller bearing arrangement offers a high loading capacity for external radial forces.
High case pressures can be achieved without leakage even at the lowest temperatures by using suitable shaft seals.
Danfoss axial piston units are designed for easy servicing. Complete dismantling and reassembly can be carried out with standard hand tools, and all components or sub-assemblies are replaceable.
Axial piston fixed displacement motors of the Danfoss pattern are made by licensed producers worldwide, providing consistent service and fully inter-changeable parts.

Typical markets

- Industrial
- Mining
- Transit Mixer
- Utility Vehicles

Technical Information Axial Piston Motors Series 20

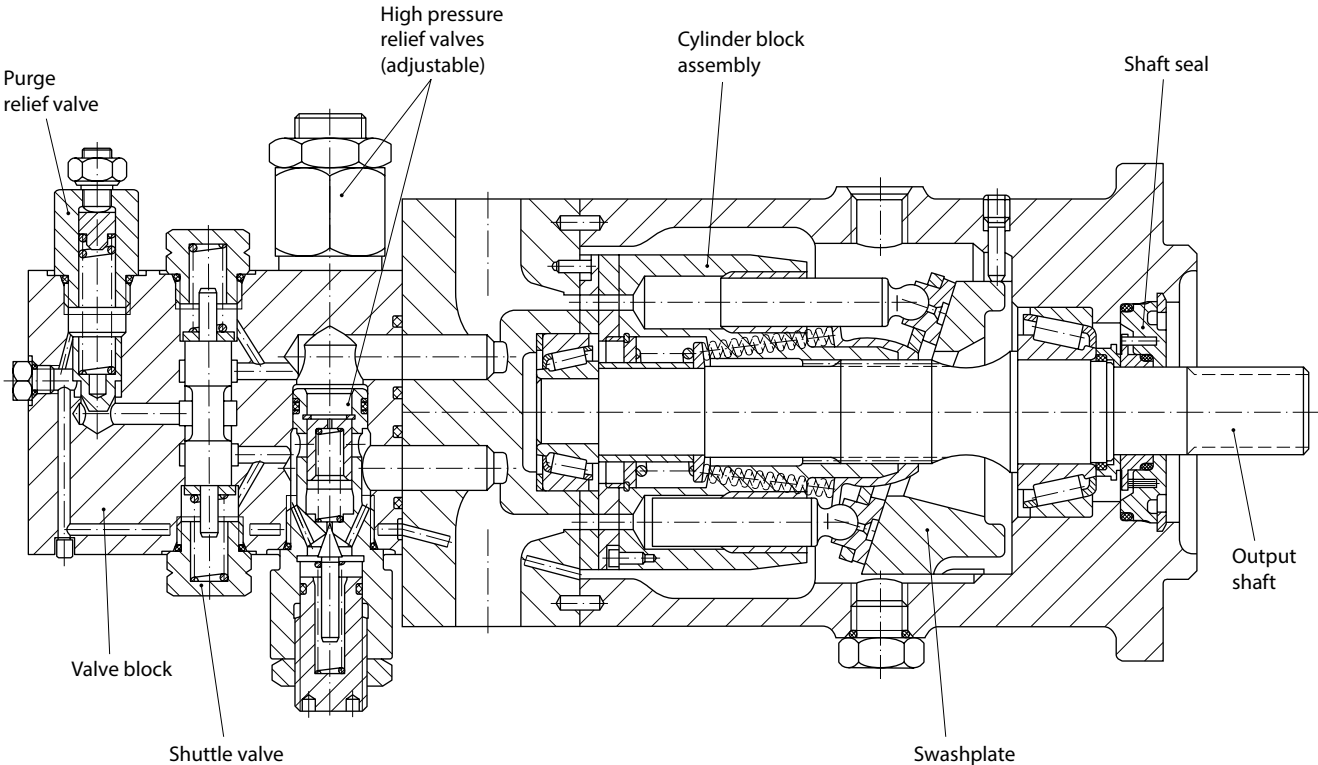
Contents

| | | |
|-----------------------------------|---|----|
| General Description | Introduction | 2 |
| | Description | 2 |
| | Typical markets | 2 |
| Sectional View | Axial piston fixed displacement motor | 4 |
| System Circuit Description | Pump and motor circuit description | 5 |
| | Motor circuit schematic | 5 |
| Technical Specification | Technical parameters | 6 |
| | Design | 6 |
| | Type of mounting | 6 |
| | Pipe connections | 6 |
| | Direction of rotation and flow | 6 |
| | Installation position | 6 |
| | External drain fluid loss | 6 |
| | Hydraulic parameters | 7 |
| | System pressure range, input p_1 | 7 |
| | System pressure range, output p_2 | 7 |
| | Case pressure | 7 |
| | Hydraulic fluid | 7 |
| | Hydraulic fluid temperature range | 7 |
| | Viscosity range | 7 |
| | Filtration | 7 |
| | Shaft load | 7 |
| | Determination of nominal motor size | 8 |
| Dimensions | Outline drawing, configuration ms | 9 |
| – Frame Size 070 and 089 | Outline drawing, basic model | 11 |
| | Outline drawing, motor configuration am 01000 | 11 |
| | Outline drawing, motor configuration mr | 12 |
| | Circuit diadrams | 13 |
| | Configuration MR | 13 |
| | Basic model and motor configuration AM 01000 | 13 |
| Dimensions | Outline drawing, configuration ms | 14 |
| – Frame Size 227 and 334 | | |

General Description

Axial piston fixed displacement motor

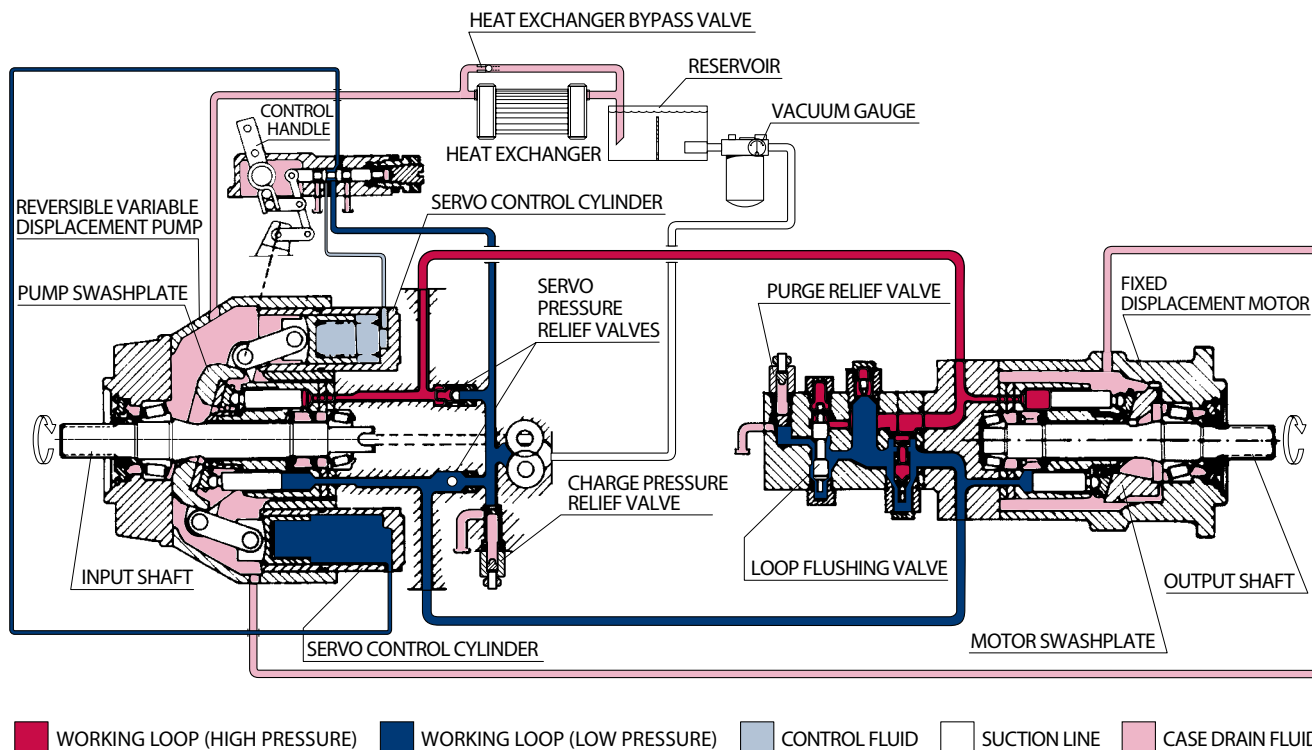
Sectional View



P005 118E

General Description

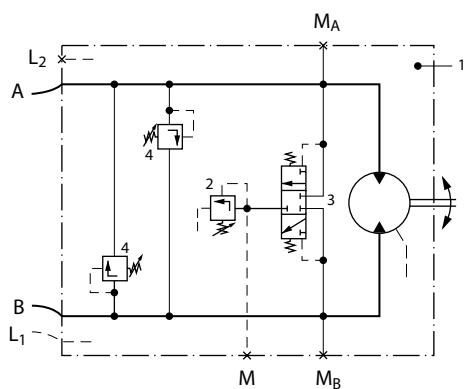
Pump and motor circuit description



P000 027E

Above figure shows schematically the function of a hydrostatic transmission using an axial piston variable displacement pump and a fixed displacement motor.

Motor circuit schematic



P000 034

Designation:

- 1 = Fixed displacement motor
- 2 = Purge relief valve
- 3 = Shuttle valve
- 4 = High pressure relief valve

Ports:

- A, B = Main pressure ports (working loop)
- L₁, L₂ = Drain ports
- MA = Gauge port for port A
- MB = Gauge port for port B
- M = Gauge port - charge pressure

Technical Specification

Technical parameters

Design

Axial piston motor with fixed displacement and swash plate design.

Type of mounting

SAE four bolt flanges.

Pipe connections

Main pressure ports: SAE split flange

Remaining ports: SAE O-ring boss

Direction of rotation and flow

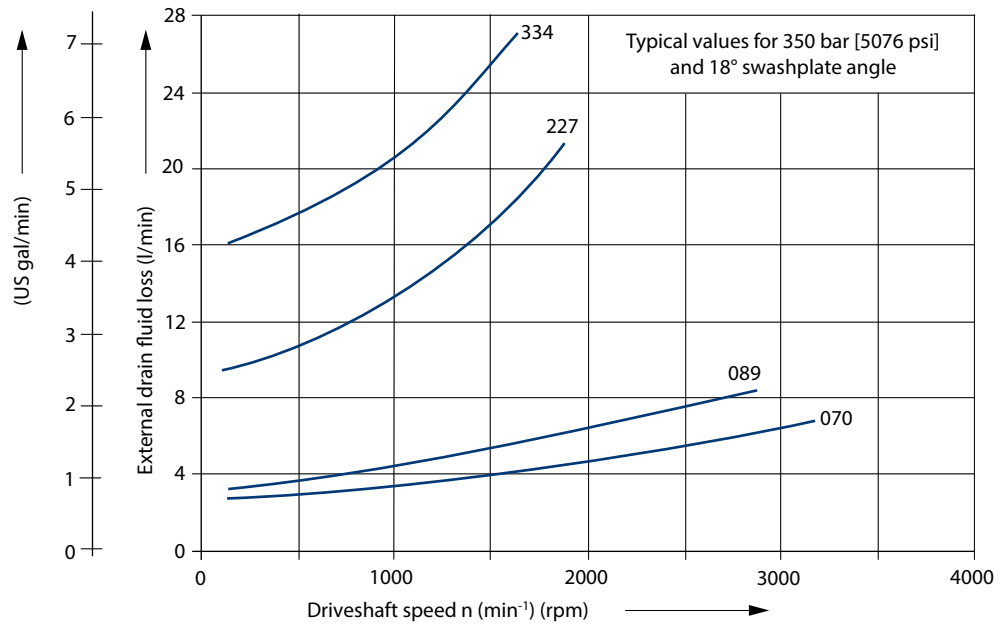
Clockwise or counterclockwise (viewing from the output shaft).

| Direction of rotation | Port A | Port B |
|-----------------------|--------|--------|
| Clockwise (R) | Output | Input |
| Counterclockwise (L) | Input | Output |

Installation position

Optional; motor housing must be always filled with hydraulic fluid.

External drain fluid loss



P005 105E

Technical Specification**Hydraulic parameters****System pressure range, input p_1**

Pressure on port A or B:

Max. operating pressure $\Delta p = 420 \text{ bar [6092 psi]}$ Max. high pressure setting $\Delta p = 460 \text{ bar}^1 \text{ [6672 psi]}$ ¹only with POR-valve**System pressure range, output p_2**

Normal setting for configuration MS and MR: 11.0 - 12.5 bar [160 - 181 psi] above case pressure.

Minimum: 8 bar, intermittent only

Case pressure

Max. rated pressure = 2.5 bar [36.3 psi]

Intermittent = 5.0 bar [72.5 psi]

Hydraulic fluidRefer to Danfoss publications [Hydraulic Fluids and Lubricants, 520L0463](#) and [Experience with Biodegradable Hydraulic Fluids, 520L0465](#).**Hydraulic fluid temperature range** $\vartheta_{\min} = -40 \text{ }^\circ\text{C} [-40 \text{ }^\circ\text{F}]$ $\vartheta_{\max} = 95 \text{ }^\circ\text{C} [203 \text{ }^\circ\text{F}]$ **Viscosity range** $\nu_{\min} = 7 \text{ mm}^2/\text{s} [49 \text{ SUS}^*]$ $\nu_{\max} = 1000 \text{ mm}^2/\text{s} [4630 \text{ SUS}^*]$ (intermittent cold start)Recommended viscosity range: 12 - 60 mm²/s [66 - 278 SUS*]

*SUS (Saybolt Universal Second)

Filtration

Required cleanliness level: ISO 4406-1999 Code 22/18/13 or better.

Refer to Danfoss publications [Hydraulic Fluids and Lubricants, 520L0463](#) and [Design Guideline for Hydraulic Fluid Cleanliness, 520L0467](#).**Shaft load**

The pump will accept radial and axial loads on its shaft, the maximum capacity being determined by direction and point of application of the load.

Please contact your Danfoss representative.

Technical Specification
**Hydraulic parameters
(continued)**
Technical data

| | | Frame size | | | |
|--|---|------------------|------------------|-------------------|--------------------|
| | | 070 | 089 | 227 | 334 |
| Max. displacement | cm ³ [in ³] | 69.8 [4.26] | 89.0 [5.43] | 227.3 [13.87] | 333.7 [20.36] |
| Rated speed 1 | min ⁻¹ (rpm) | 3200 | 2900 | 2100 | 1900 |
| Theoretical torque | Nm/bar [in lb/1000 psi] | 1.11 [677] | 1.42 [867] | 3.62 [2209] | 5.31 [3240] |
| Mass moment of inertia of rotating group | kg m ² · 10 ⁻³ [lbf·ft ² · 10 ⁻³] | 12.34 [292.8] | 17.77 [421.7] | 86.80 [2059.8] | 161.40 [3830.0] |

¹ for higher speeds contact your Danfoss representative

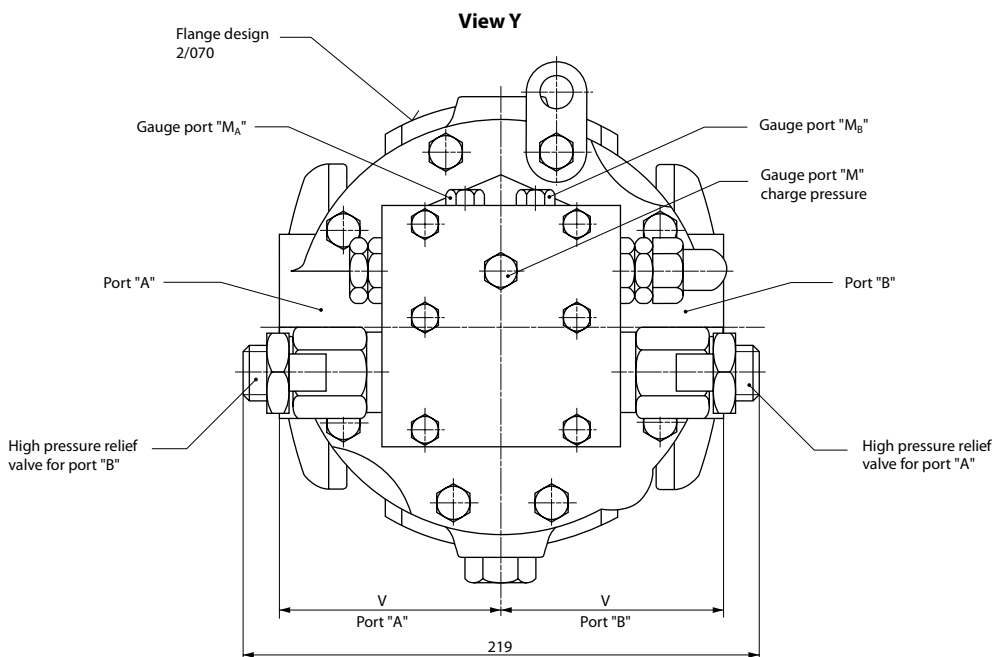
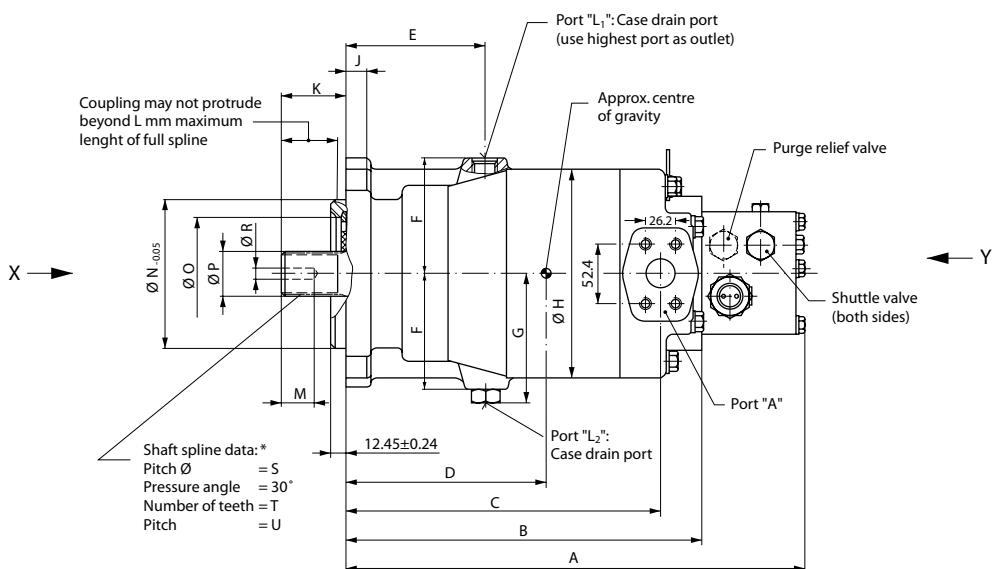
Determination of nominal motor size

| Unit: | Metric System: | | Inch System |
|----------------------|--|-------------------|---|
| <i>Input flow</i> | $Q_e = \frac{V_g \cdot n}{1000 \cdot \eta_v}$ | l/min | $Q_e = \frac{V_g \cdot n}{231 \cdot \eta_v}$ [gpm] |
| <i>Output torque</i> | $M_e = \frac{V_g \cdot \Delta p \cdot \eta_m}{20 \cdot \pi}$ | Nm | $M_e = \frac{V_g \cdot \Delta p \cdot \eta_m}{2 \cdot \pi}$ [lbf·in] |
| <i>Output power</i> | $P_e = \frac{Q_e \cdot \Delta p \cdot \eta_t}{600}$ | kW | $P_e = \frac{V_g \cdot n \cdot \Delta p \cdot \eta_t}{396\,000}$ [hp] |
| <i>Speed</i> | $n = \frac{Q_e \cdot 1000 \cdot \eta_v}{V_g}$ | min ⁻¹ | $n = \frac{Q_e \cdot 231 \cdot \eta_v}{V_g}$ (rpm) |

Efficiency characteristic curves available on request.

| | | | |
|------------|-------------------------------------|-------------------|--------------------|
| V_g | = Motor displacement per revolution | cm ³ | [in ³] |
| n | = Motor speed | min ⁻¹ | (rpm) |
| Δp | = Hydraulic pressure differential | bar | [psid] |
| | $\Delta p = p_{HD} - p_{ND}$ | | |
| η_v | = Motor volumetric efficiency | | |
| η_m | = Motor mechanical efficiency | | |
| η_t | = Motor total efficiency | | |
| p_{HD} | = High pressure | bar | [psid] |
| p_{ND} | = Low pressure | bar | [psid] |

Dimensions

 – Frame Size 070 and 089 cm³
Outline drawing, configuration MS


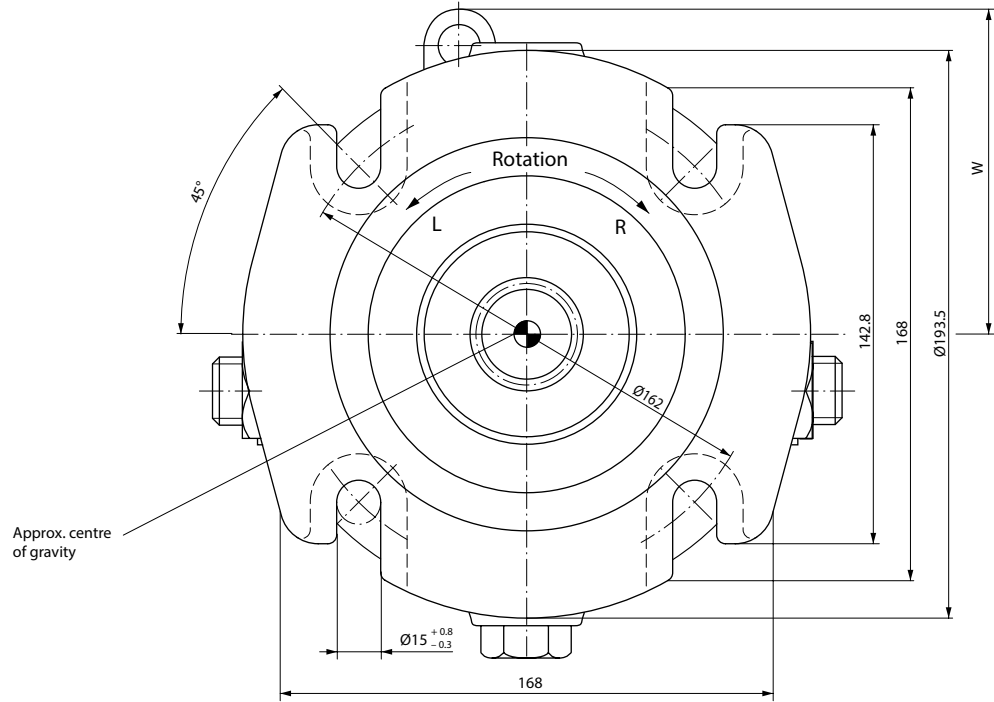
* Shaft spline data: spline shaft with involute spline, according to SAE handbook, 1963, class 1, fillet root side fit.

| Frame size | Port A and B | Port L ₁ and L ₂ | Port M _A and M _B | Port M |
|------------|--|---|--|--------|
| 070 | SAE flange, size 1 SAE split flange boss 5000 psi 4 threads | 7/8-14 UNF-2B SAE straight thread O-ring boss | 7/16-20 UNF-2B SAE straight thread O-ring boss | |
| 089 | 3/8-16 UNC-2B 18 deep | | | |

Dimensions
 – Frame Size 070 and 089 cm³

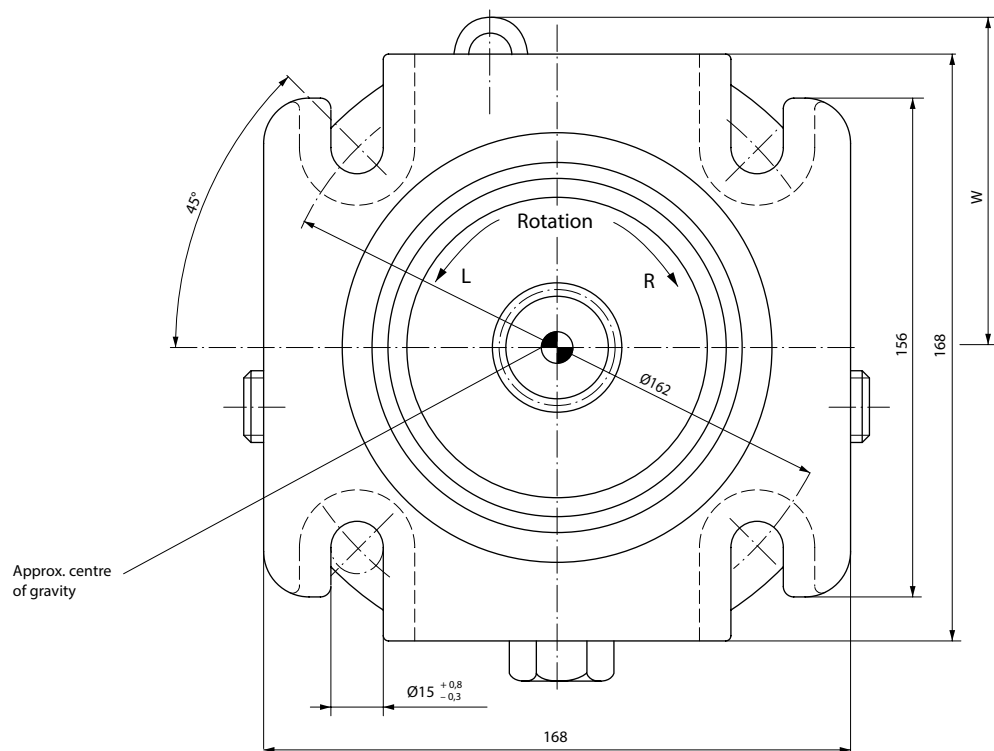
Outline drawing,
 configuration MS
 (continued)

View X (for SMF 2/070 only)



P005 119E

View X (for SMF 2/089 only)

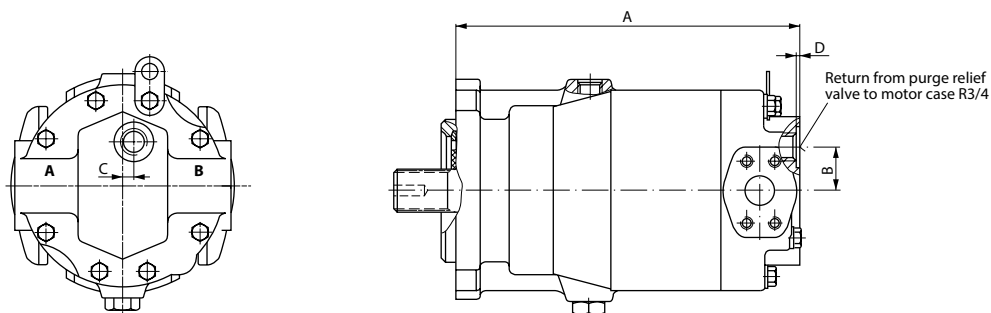


P005 120

Dimensions

 – Frame Size 070 and 089 cm³
Outline drawing, configuration MS (continued)
Dimensions

| Frame size | A mm [in] | B mm [in] | C mm [in] | D mm [in] | E mm [in] | F mm [in] | G mm [in] | Ø H mm [in] | J mm [in] | K mm [in] | L mm [in] | M mm [in] |
|------------|--------------|--------------|---|-------------|----------------|--------------|-------------|--------------|-------------|--|----------------|--------------|
| 070 | 378 [14.882] | 290 [11.417] | 255 [10.039] | 165 [6.496] | 108 [4.252] | 86.5 [3.406] | 98 [3.858] | 161 [6.339] | 16 [0.630] | 56 [2.205] | 48 [1.890] | 28.4 [1.118] |
| 089 | 395 [15.551] | 307 [12.087] | 273 [10.748] | 170 [6.693] | 118 [4.646] | 96.0 [3.780] | 107 [4.213] | 181 [7.126] | 18 [0.709] | 56 [2.205] | 48 [1.890] | 28.4 [1.118] |
| Frame size | Ø N mm [in] | Ø O mm [in] | Ø P mm [in] | Ø R mm [in] | Ø S mm [in] | T mm [in] | U mm [in] | V mm [in] | W mm [in] | Diameter for shaft coupling mm [in] | Weight kg [lb] | |
| 070 | 127 [5.000] | 84 [3.307] | 34.50 ^{-0.17} [1.358 ^{-0.0067}] | 8.5 [0.335] | 33.338 [1.313] | 21 [0.827] | 16/32 | 85.8 [3.378] | 101 [3.976] | 31.75 ^{+0.062} [1.250 ^{+0.0024}] | 40 [88] | |
| 089 | 127 [5.000] | 98 [3.858] | 37.68 ^{-0.17} [1.483 ^{-0.0067}] | 8.5 [0.335] | 36.513 [1.438] | 23 [0.906] | 16/32 | 95.2 [3.748] | 114 [4.488] | 34.95 ^{+0.062} [1.376 ^{+0.0024}] | 47 [104] | |

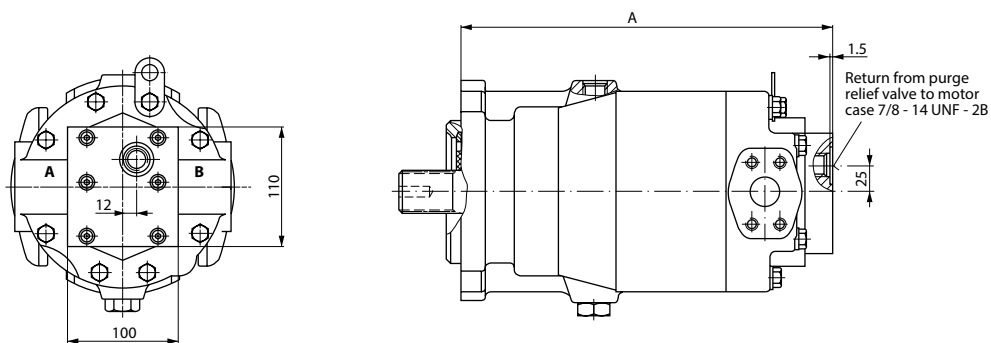
Outline drawing, basic model


P000 568E

Dimensions

| Frame size | A mm [in] | B mm [in] | C mm [in] | D mm [in] | Weight kg [lb] |
|------------|--------------|------------|------------|-----------|----------------|
| 070 | 290 [11.417] | 30 [1.181] | 12 [0.472] | 2 [0.079] | 34 [75] |
| 089 | 307 [12.087] | 44 [1.732] | 6 [0.236] | | 41 [90] |

For further dimensions see previous pages.

Outline drawing, motor configuration AM 01000


P000 569E

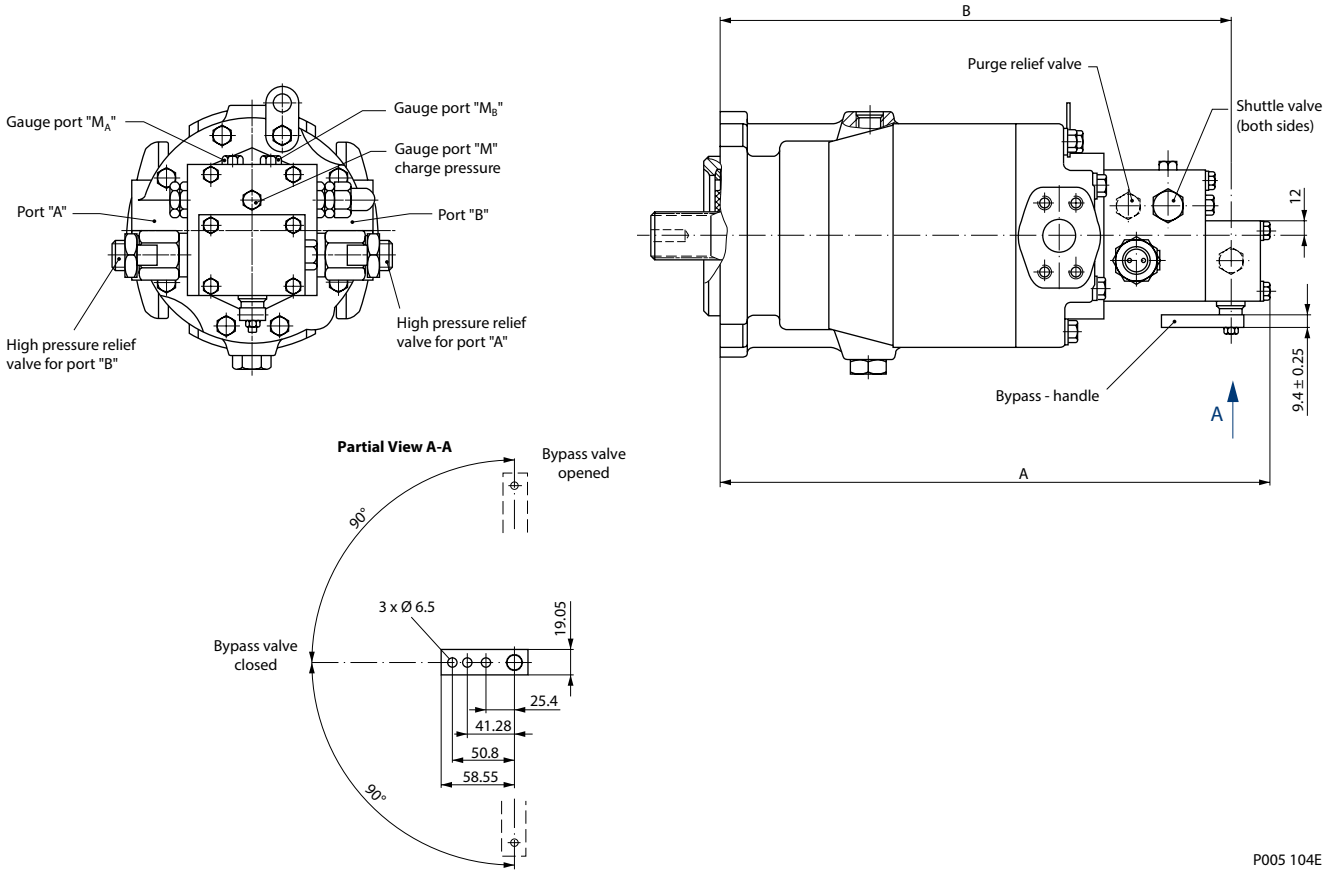
Dimensions

| Frame size | A mm [in] | Weight ¹ kg [lb] |
|------------|--------------|-----------------------------|
| 070 | 315 [12.402] | 36 [79] |
| 089 | 332 [13.071] | 43 [95] |

¹ Light weight and short options available on request
 For further dimensions see previous pages.

**Dimensions –
Frame Size 070 and 089 cm³**

**Outline drawing, motor
configuration MR**



Dimensions

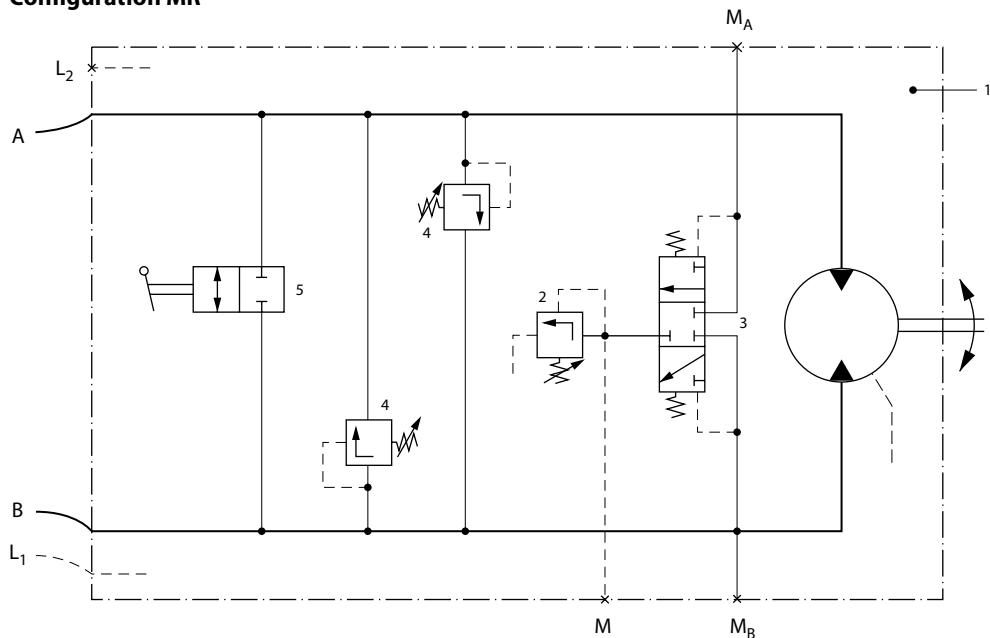
| Frame size | A mm [in] | B mm [in] | Weight kg [lb] | Port M _A and M _B | Port M |
|------------|--------------|--------------|----------------|---|--------|
| 070 | 426 [16.772] | 391 [15.394] | 42 [93] | 7/16-20 UNF-2B SAE straight thread O-ring boss | |
| 089 | 443 [17.441] | 408 [16.063] | 49 [108] | | |

For further dimensions see previous pages.

Dimensions
 – Frame Size 070 and 089 cm³

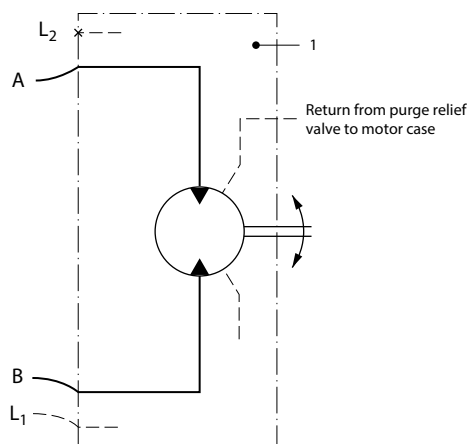
Circuit diagrams

Configuration MR



P000 035

Basic model and motor configuration AM 01000



P000 038E

Designation:

- 1 = Fixed displacement motor
- 2 = Purge relief valve
- 3 = Shuttle valve
- 4 = High pressure relief valve
- 5 = Bypass valve

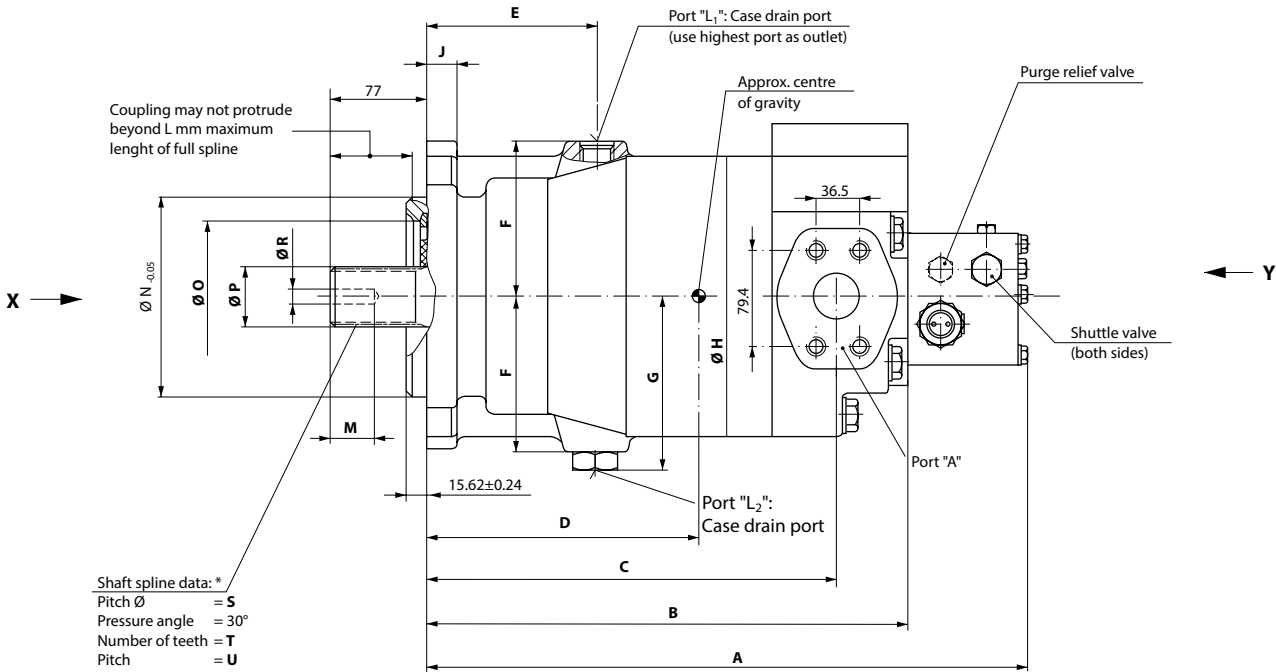
Ports:

- A,B = Main pressure ports (working loop)
- L₁, L₂ = Drain ports
- M_A = Gauge port for port **A**
- M_B = Gauge port for port **B**
- M = Gauge port - charge pressure

Technical Information Axial Piston Motors Series 20

Dimensions – Frame Size 227 and 334 cm³

Outline drawing, configuration MS



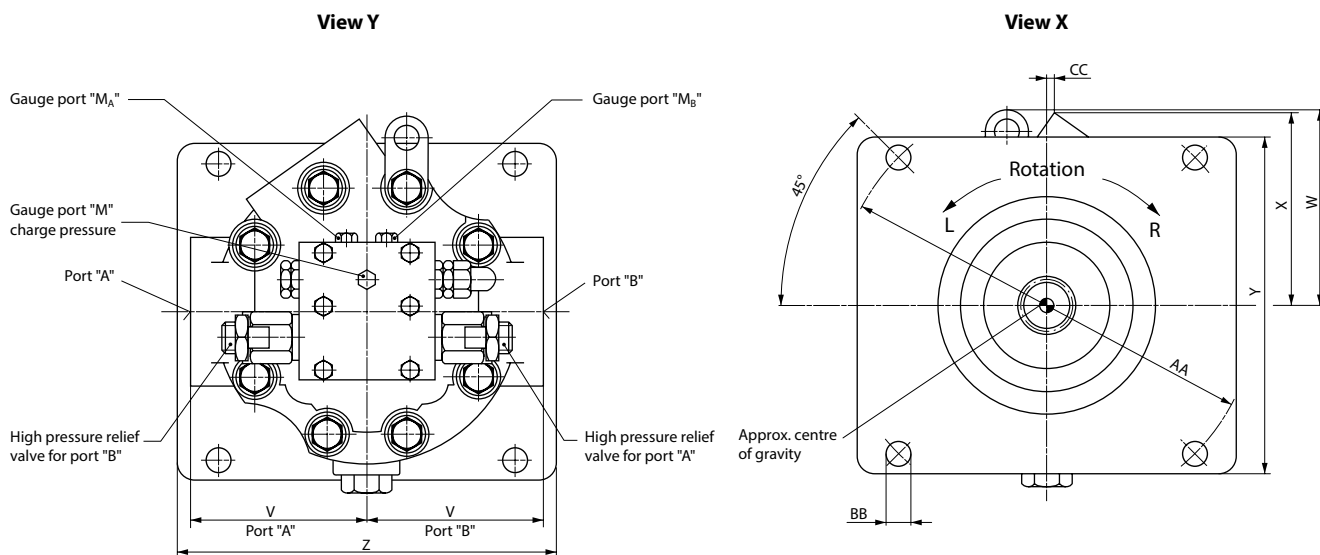
P005 100E-1

Dimensions

| Frame size | A mm [in] | B mm [in] | C mm [in] | D mm [in] | E mm [in] | F mm [in] | G mm [in] | Ø H mm [in] | J mm [in] |
|------------|--------------|---------------|--------------|---------------|----------------|----------------|-------------|-------------------------------------|----------------|
| 227 | 498 [19.606] | 410 [16.142] | 346 [13.622] | 228.5 [8.996] | 139.7 [5.500] | 134.9 [5.311] | 152 [5.984] | 264 [10.394] | 27 [1.063] |
| 334 | 537 [21.142] | 449 [17.677] | 389 [15.315] | 278 [10.945] | 154 [6.063] | 143. [5.650] | 161 [6.339] | 292 [11.496] | 38 [1.496] |
| Frame size | M mm [in] | Ø N mm [in] | Ø O mm [in] | Ø P mm [in] | Ø R mm [in] | Ø S mm [in] | T mm [in] | U mm [in] | V mm [in] |
| 227 | 38.4 [1.512] | 165.1 [6.500] | 110 [4.331] | 44.03 [1.733] | 11.80 [0.465] | 42.863 [1.688] | 27 [1.063] | 16/32 | 143.7 [5.657] |
| 334 | 46.2 [1.819] | 177.8 [7.000] | 114 [4.488] | 64.66 [2.546] | 14.35 [0.565] | 63.500 [2.500] | 40 [1.575] | 16/32 | 158.7 [6.248] |
| Frame size | W mm [in] | X mm [in] | Y mm [in] | Z mm [in] | AA mm [in] | BB mm [in] | CC mm [in] | Diameter for shaft coupling mm [in] | Weight kg [lb] |
| 227 | 156 [6.142] | 160 [6.299] | 265 [10.433] | 265 [10.433] | 317.5 [12.500] | 20.6 [0.811] | 13 [0.512] | 41.28 [1.625] | 152 [335] |
| 334 | 176 [6.929] | 174 [6.850] | 298 [11.732] | 298 [11.732] | 350 [13.780] | 27.0 [1.063] | 18 [0.709] | 61.93 [2.438] | 197 [434] |

* Shaft spline data: spline shaft with involute spline, according to SAE handbook, 1963, class 1, fillet root side fit.

Dimensions

 – Frame Size 227 and 334 cm³
**Outline drawing,
configuration MS
(continued)**


P005 100E-2

| Frame size | Port A and B | Port L ₁ and L ₂ | Port M _A and M _B | Port M |
|------------|--|---|--|--------|
| 227 | SAE flange, size 1 1/2 SAE split flange boss 6000 psi 4 threads | 1 7/8-12 UNF-2B SAE straight thread O-ring boss | 7/16-20 UNF-2B SAE straight thread O-ring boss | |
| 334 | 5/8-11 UNC-2B 35 mm deep | | | |



Products we offer:

- Bent Axis Motors
- Closed Circuit Axial Piston Pumps and Motors
- Displays
- Electrohydraulic Power Steering
- Electrohydraulics
- Hydraulic Power Steering
- Integrated Systems
- Joysticks and Control Handles
- Microcontrollers and Software
- Open Circuit Axial Piston Pumps
- Orbital Motors
- PLUS+1® GUIDE
- Proportional Valves
- Sensors
- Steering
- Transit Mixer Drives

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electronic components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market. Building on our extensive applications expertise, we work closely with our customers to ensure exceptional performance for a broad range of off-highway vehicles.

We help OEMs around the world speed up system development, reduce costs and bring vehicles to market faster.

Danfoss – Your Strongest Partner in Mobile Hydraulics.

Go to www.powersolutions.danfoss.com for further product information.

Wherever off-highway vehicles are at work, so is Danfoss.

We offer expert worldwide support for our customers, ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide comprehensive global service for all of our components.

Please contact the Danfoss Power Solution representative nearest you.

Comatrol

www.comatrol.com

Schwarzmueller-Inverter

www.schwarzmueller-inverter.com

Turolla

www.turollaocg.com

Valmova

www.valmova.com

Hydro-Gear

www.hydro-gear.com

Daikin-Sauer-Danfoss

www.daikin-sauer-danfoss.com

Local address:

Danfoss Power Solutions (US) Company
2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239 6000

Danfoss Power Solutions GmbH & Co. OHG
Krokamp 35
D-24539 Neumünster, Germany
Phone: +49 4321 871 0

Danfoss Power Solutions ApS
Nordborgvej 81
DK-6430 Nordborg, Denmark
Phone: +45 7488 2222

Danfoss Power Solutions Trading (Shanghai) Co., Ltd.
Building #22, No. 1000 Jin Hai Rd
Jin Qiao, Pudong New District
Shanghai, China 201206
Phone: +86 21 3418 5200

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.